Development of a User Interface Application for Ipoh City Council Department of Town Planning Day-to-Day Data Sharing Services

By

Mohamad Shahrustami b. Mohd Nadzeri

A project dissertation submitted in partial fulfillment of
the requirement for the
Bachelor of Engineering (Hons)
(Civil Engineering)

DECEMBER 2004

Universiti Teknologi PETRONAS
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31750 Tronoh
Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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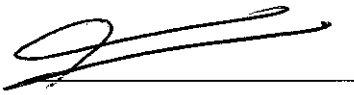

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UNIVERSITI TEKNOLOGI PETRONAS
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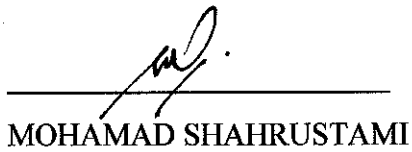
December 2004

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



MOHAMAD SHAHRUSTAMI B. MOHD NADZERI

ABSTRACT

The focus of this Final Year Project is on the development of the User-Interface Application which forms a part of the whole integrated system of the information delivery method for Ipoh City Council (MBI) Planning Department on this particular service to various public for various purposes. The purpose of this report is to present on the project's objectives, project deliverable and finally which is the main content and aim of this report on the final product of this project. The first part of this report presents on the background of the project, its problem statement, project's objectives as well as the scope of work concerned. The following discussion focus on the result and its corresponding discussion which is the User-Interface Application itself in terms of its functions and deliverable while the final part of this report concludes the report with a recommendations for the next steps of future undertakings and possible improvements to the application to enhance its usage and value.

ACKNOWLEDGEMENTS

First and foremost, my gratitude forwarded to the project's supervisors, Mrs. Noor Amila bt. Wan Abdullah Zawawi and Dr. Abdul Nasir Matori for their direction, commitment and support towards this project and to Miss Jaslina Shaidin, one of the Ipoh City Council (MBI) Planning Officer who proposed this project and whose department is going to employ this product fully to replace their conventional method of delivery system which makes it is so valuable for the student's final year project and makes it has a good potential to be marketed.

Special thanks to Miss Komathy Krishnan, who is teaching computer programming in COSMOPOINT Institute of Information Technology in Ipoh for her very valuable support and contribution throughout the Implementation period of this project which is beyond expectation and which I think, could not be refunded by whatever means from this world. Thanks a lot!

Thanks also to Mrs. Saadiah Mohd Saat, one of the Research Officer in UTP Civil Engineering Department as well as a Master student specializing in GIS (Geographic Information System) for her contribution at the very beginning of the Implementation phase of this project and thanks for borrowing me some books on GIS Application and manuals.

Thanks to my family especially to my parents and my elder sister who has supported me a lot with opinions and valuable advice. Thanks a lot!

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Last but not least, thanks to those who directly or indirectly has supported and contributed towards the success of this project.

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CHAPTER 1
INTRODUCTION

1.1 Project's Background

Housing, industrial and commercial area distribution, site location, underground and public utilities, land use pattern of particular urban area are few types of information on urban characteristics needed by various people. For example, they are landowner who want to build a house, shop owner or renter who want to setup offices or business outlets, developer who seek for the possibility of building a residential scheme or townships, towards civil engineers in performing regular inspection, maintenance and planning for future expansion of the underground utilities to cater for the new development in a particular region of a city, as well as towards others various governmental and non-governmental agencies where these examples of information are critical for their day-to-day operation and decision-making.

While these and others types of information on urban characteristics are provided by the Planning Department of a City or Municipal Councils of a particular urban or municipal area, the current system used by most of Malaysian City and Municipal Councils in delivering the information is human-based. The meaning of human-based here is the seeker, or those who needs these information whether the land or shop owner, developer, or engineer for instance, has to step into the Planning Department themselves to get the information that they required where the front-desk staff of the department will entertain every single seeker who come to ask for a specific information that the department keeps and maintains. After searching on the requested information done by the front-desk staff through the department's massive filing system, the relevant information will then be copied and given to the seeker in terms of hardcopy and this information will then be charged by the department for the copies made as well as for the value entitled with the information itself. Thus, this kind of service provided by the Planning Department has a return in itself in terms of the department's income to maintain and update their database regularly as the seeker will always demand for the up-to-date information from the

department. For that reason, by improving the current delivery system discussed above may certainly increase the department's income twofold since in a day, not only one but many people who come to the Planning Department to ask about the information on urban characteristics that the department provides and depending on the number of front-desk staff available at one time as well as their familiarity with the filing system, types of information requested, the size of the filing or database system that the department have, as well as the handling method used in storing and managing the filing, the average time consumed for each seeker to attain the information required is 25 minutes[1]. It is therefore the most suitable and effective way in delivering this information is through computerized system with the use of lesser number of front-desk staff to entertain requests from the seeker and the system should be friendly and easy enough for the seeker to use and attain the required information. It is expected that the improved delivery method will reduce this figure up to less than 10 minutes per person so that more seeker can be entertained per day as compared to the conventional method.

In the case of urban planner of the Municipal or City Council itself, the significance of the information on the current land use pattern or downtown building characteristics (e.g. building heights, age, built-up area etc.) for instance is critical for their decision making on the zoning strategies from which a sustainable planning practices are applied. For instance, by knowing the distribution and total area of business districts and by considering the current demand and potential future increase in demand for this type of use at the city centre will give an indication to the urban planner to plan for adequate housing scheme and whether or not to improve the current public transportation system to cater for the demand. In this example, urban planner may collaborate with the engineers and professionals from various fields to together formulate the zoning ordinances which are to be incorporated for future development effort.

[1] This statistics (2001) is provided by Taiping Municipal Council Department of Town Planning and Building Control.

Decision on whether or not to widen the current road network or to increase the accessibility of public to the city centre by opening alternative road to the area where the trip demand is relatively high (e.g. shopping complexes, theme parks etc.) or decision on whether or not to construct a ring road network to minimize traffic entering the congested city centre by distributing traffic based on the origin-destination mechanism are all responsibility of the urban planners and engineers of the Municipal or the City Council and they should not have only a comprehensive information on the current land use pattern and future pattern in development demand, current infrastructure but also should be able to integrate all these inter-related information in spatial form for them to make fast and effective decision. For instance, just by superimpose spatial data on future land use pattern with the current road network and underground utilities (e.g. pipeline networks, sewer, etc.) may indicate the engineers whether or not to upgrade the existing scheme of these infrastructure to cater for the future development. It is therefore there is a need for not only improved delivery method of this urban-related information but also the need to support urban planners and engineers who work for Municipal or the City Council in their critical and routine decision making activities through an integrated system.

In order to enhance the effectiveness of this integrated delivery system, the database, instead of in a form of filing documents, has to be upgraded into a computerized form which is to be synchronized with the integrated delivery system. It is therefore the upgrading of both the information format as well as the current delivery method towards a more integrated device will certainly enhance the effectiveness of information delivery services by the Planning Department and will support both urban planners and engineers to make an informed and critical decision on their strategies towards urban related matter.

1.2 Problem Statement

Like others Malaysian Local Authorities, where providing information on the urban characteristics for the use of people from various backgrounds for various needs is one of the most important and routine activities, Ipoh City Council (MBI) Planning Department has identified the need to improve their current method of delivery from human-based towards integrated computerized system. The integrated computerized system should also include appropriate tools to facilitate urban planners and engineers to manipulate that information on the urban characteristics for their planning and decision-making activities.

With the expansion of the MBI area from 137.50 km^2 to 387.63 km^2 in the year 1997, the size of the Planning Department database will certainly increases and thus the demand for the information will also increase. Of course, the main important factor that causes this increase in the demand is the increase in demand to develop land, redevelop former building or shop lots, opening new offices and business outlets, residential and industrial areas etc. within the MBI area. For example, as one of the requirement for a shop owner to open an office or business outlet is to attach the owner site location with the planning application to the Planning Department for approval. If the owner wants to open a restaurant or a food center, he/she must also submit related information regarding the proposed site and its surrounding environment to the Health Department for their approval. This information which has to be kept up-to-date by the Planning Department will ease the shop owner to prepare his/her planning application to the MBI. Meanwhile, as the city expands with new development and redevelopment progress and the possible demand for development associated with a construction of a new road networks to access to the new identified area for development for instance, the needs to revise the current zoning strategies and the needs to investigate on the possibility of upgrading the current infrastructure capacity and performance to cater for the demand and future development are critically important for most urban planners and engineers who works with the City Council itself. It is therefore there is a need of not only improved delivery method of the urban-related information concerned, but also improved means or tools to support urban

planners and engineers to perform their routine tasks and that is why this project came into being.

1.3 Objectives

Following are the objectives of this project:

1. To provide self-reception and self-service concept of day-to-day request of information by the public.
2. To support engineers and urban planners in their routine tasks of planning and decision-making
3. To effectively reduced the time needed for the seeker to attain the required information from the Planning Department front-desk staff.
4. To reduced the number of staff needed to entertain or provides the services to the seeker.
5. To exploit the benefit of GIS technology into day-to-day operation of the Planning Department.
6. To ensure that the client would still be able to obtain necessary information through self-service approach when there are no personnel at the time to perform the task, which in turn will improves and maintain the service quality and availability of the Planning Department.

1.4 Scope of Works

Since MBI Planning Department already has their database in a digitized form, the only thing that they want to improve is their information delivery system. It is therefore the focus of this Final Year Project is on the delivery system for MBI Planning Department. However, since the huge scope of the delivery system which comprises of several method of information delivery and within the limited timeframe, this Final Year Project will only focus on the design and development of the User-Interface Application tailored for the use by landowners who come to the front-desk of the Planning Department to attain information on their land and its surrounding vicinity as well as for the use of MBI urban planners and engineers to support their planning and decision-making activities. For the case of landowner as a user, this application will direct the seeker to the department's database through a computer provided at the front-desk and this approach is also known as a self-service approach of getting urban related information.

Most of the time, the User-Interface Application will perform queries made by the user (the term 'user' instead of 'seeker' will be used throughout the following discussion) by sending the queries made into the application and will direct the application to display the information in a form of map and table. The display will then be made a copy via a print out function provided in the application for user's record and retention which is connected to the department's printer provided at the front-desk. The fee or charge for the information will then be paid by the user to the available front-desk staff and this only applied to the landowner type of user while urban planners and engineers are as an exception.

CHAPTER 2
LITERATURE REVIEW

Given the dynamic nature of planning and management carried out at local level, it is not surprising that the local authorities become one of the largest users of GIS in advanced and developed countries. In Malaysia, only a small number of District Councils and Municipalities have already invested in GIS. However, the one-time reluctance of local authorities to accept the challenge to embrace the technology is mainly due to an earlier lack of support from the management level, the lack of in-house expertise to make use of the system and the high cost of GIS, which has been countered by the support given directly by the Federal Government in realizing the concept of e-planning.

The present system of development control in most local authorities in Malaysia is by granting or refusal of planning permission for development. The local authority is empowered to approve or refuse any planning application in its area. The recent amendment to the Town and Country Planning Act requires that certain planning applications shall be accompanied by a development proposal report which includes a written statement and a plan to describe the present condition of the land to which the application relates, as well as describe the proposed development, in particular on how it would be likely to have significant effect on the built environment. In most cases, a development proposal report involves a technique for the systematic compilation of expert quantitative analysis and qualitative assessment of project land use and property development viability, including its effect on the surrounding area, and the presentation of results in a way that enables the importance of the predicted results, and the scope of modifying or mitigating them to be properly evaluated by the relevant decision making body before a planning permission is rendered.

Following are the major aspects of information which are required for a development proposal report:

i) Status of land and restrictions.

ii) Land use analysis and intensity of development – this includes land use zoning, population density zoning, height limit, plot ratio, plinth area, predetermined public area.

iii) Analysis of issue and potential of sites – this includes site location, existing drainage system, topography and slope, existing road system, existing land use, natural features which must be preserved and development potential.

iv) Analysis of surrounding development – this includes infrastructure type, intensity and facilities available in the surrounding area.

v) The policies of the Structure Plan and Local Plan if available.

In addition, planning proposal report should also observe the planning standards or other policies, which may be imposed from time to time. The report will then have to be verified by the local authority concerned, in particular by the Planning Division. The report together with other considerations will be used as a basis for making decision.

Based on the above process of development control, any planning application submitted by individuals or developers who would like to develop a particular piece of land within the particular local authority control have to be incorporated with the planning proposal which incorporates a comprehensive information about the land itself as well as its surrounding environment and these information are only provided by the Local Authority, in particular, the Planning Division. As the demand of this urban-related information is increasing, hence the delivery method of this information to public should also be improved as what is one of the purposes of this project.

CHAPTER 3
METHODOLOGY

To ensure for the set objectives to be targeted, a set of procedures had been formulated and used for the whole development of this project. Following are the methodology that has been structured to undertake this project effectively:

1. Problem Definition
2. Identification of Need
3. Data Collection
4. Preliminary Conceptual Design
5. Final Design
6. Implementation

In defining the problem, the MBI current method of delivery system had been selected as the problem statement whereby the need for the improvement of the current system into computerized and self-service based delivery method is the solution to the problem. However, as defined in Chapter 1 on Scope of Work, the focus was only made on the design and development of the User-Interface Application which form a part of the whole improved delivery system.

The next step was the production of a conceptual design whereby relevant information regarding the kind of urban related information needed to be integrated with the application and how the application in terms of appearance will looks like were identified via Data Collection. At this stage, the MBI Planning Department had been working together in addressing those needs. In addition, recommendations from the Project Supervisors to the application also had been taken into consideration. After all relevant information is gathered, the next task was the production of Preliminary Conceptual Design. The importance of this conceptual design is to be an early form of mean for communicating the whole idea of the project to various personnel who directly or indirectly involved in this project and it continuously improve the design form from one

simple state towards a better solution throughout its design period when the idea of the project presented to a wide range of personnel throughout its design period.

After the design had been finalized and there was no further improvement to the early form of the conceptual design, the Final Design of the application had been produced. This final design had been the basis for the final stage of the project development, which is Implementation.

The Implementation of the project started with the selection of the material involved. It should be borne in mind that the end-product of this project is an integrated computer application and it is therefore the process of implementation will focus on the development of the product via computer programming means. In this implementation stage, Microsoft Visual Basic version 6.0 had been selected as the programming language to develop the application and MapInfo Professional version 7.0 is the medium of which the data are kept and maintained and it is to be integrated with the User-Interface Application.

CHAPTER 4
RESULTS AND DISCUSSION

The end-product of this project is the User-Interface Application and the focus of this chapter is on the function of the application itself and its possibility in improving the delivery method currently practiced by MBI Planning Department will be justified. The contents of this chapter will starts from the very basic of the application itself, which is the appearances and the tools it is comprised of towards the function of its main component, the queries tools as well as others map-related tools provided.

4.1 User Access Level

The appearance of the application is shown in Fig. 4.1 once the user is channeled to the Planning Department's database and this first form of the application is called the User Access Level. The color of the interface is chosen based from the colors of bougainvillea, the official flower for Ipoh. It is noted that the User-Access Level interface is the main form on which all the events and functions associated with the application will be worked and displayed.

The topmost part of the interface shows the potential owner of this application, which is MBI with the name of the application placed at the top as well as MBI logo on the top left. The interface is further consists of three (3) parts, on the left is the open/close map/layers and queries function, the main tools used with the map placed on the right of the interface and the display box in the middle on which the map/layers and events for each functions and tools will be displayed and activated correspondingly.

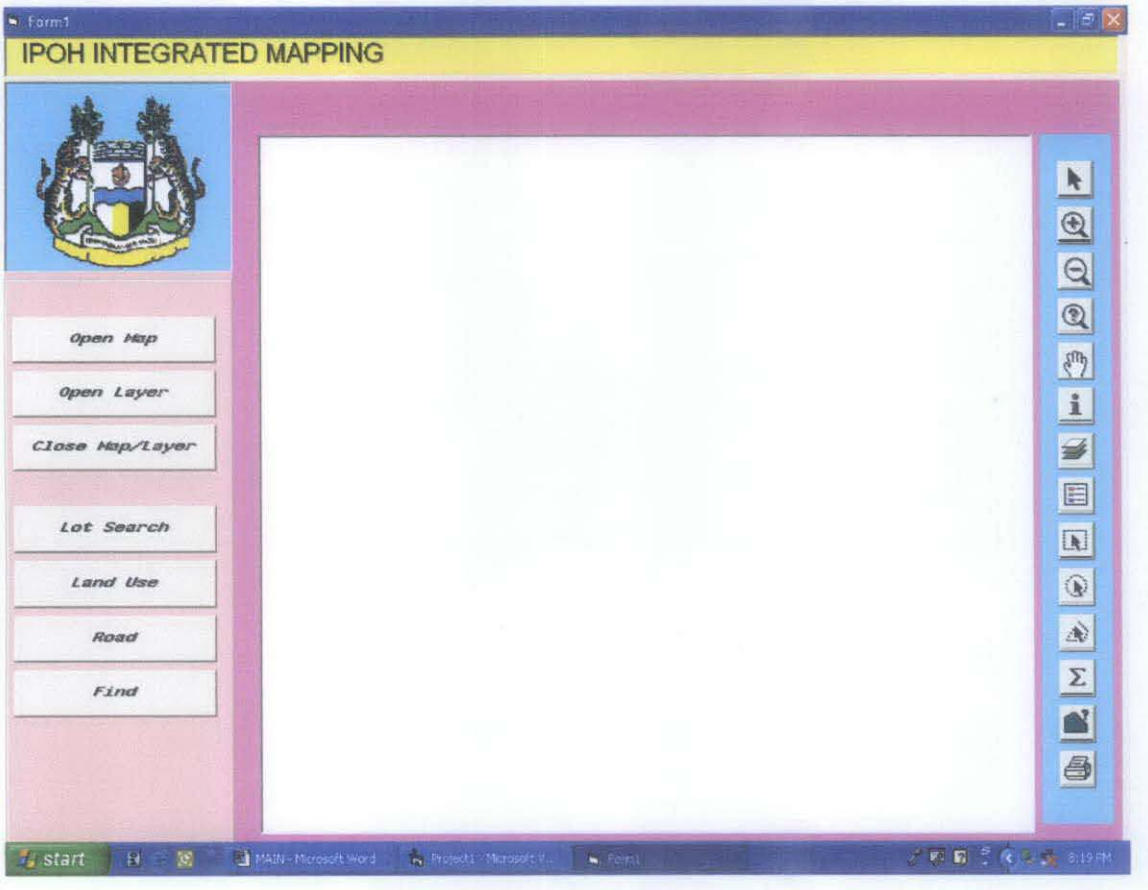

Fig. 4.1: User Access Level

4.2 Open Map

This is the main function of the application where it will open the map of Ipoh with colored regions showing different types of land uses (see Fig. 4.2). The color representation on these different land uses could be view by clicking  or Show/Hide Legend tool in the Toolbar. In fact, this Open Map function is the first and foremost thing that the user will perform before making any spatial query for example by asking the application to show on the map the location of his/her land lot through any of the Queries function; Lot Search, Land Use, Road or Find. Since the scope of this project is on Ipoh city centre district only, the current application only displays map of the city centre district. The addition for others parts or districts of Ipoh could be easily incorporated by saving the new map into the same file where the current map is located.

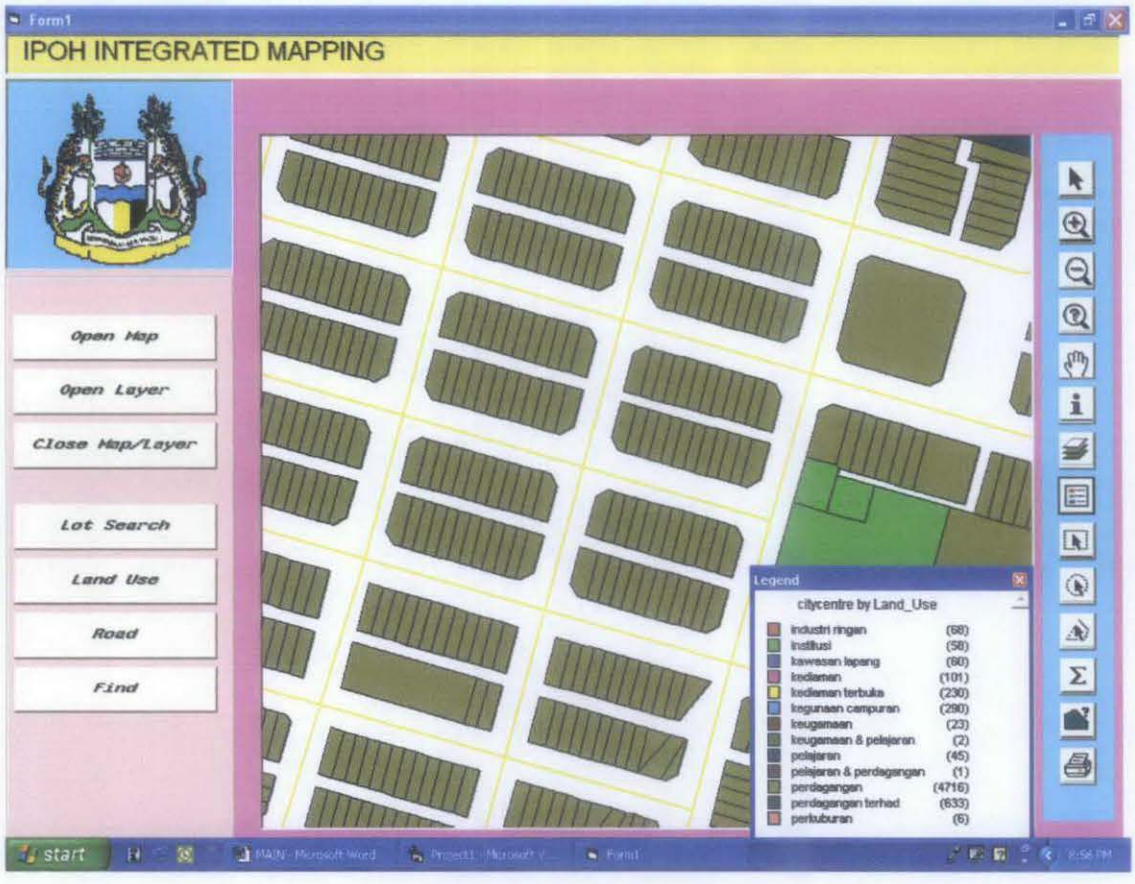

Fig. 4.2: Map appears when Open Map command clicked

4.3 Open Layer

This has almost the same function with Open Map where it opens map and the difference is that the Open Layer opens the map layer by layer (see Fig. 4.3). Explanation should arrive here. Actually, the map of which the application communicated with is constructed in several layers through MapInfo application and each layer displays different information of the map. For instance a typical map may contains spatial data on land lots, road networks, rivers, railway networks, water supply pipelines etc. and each of these data is actually constructed and contained in each different layer. Land lots are in one layer, road networks in another layer, river in another layer and so on. By superimposing all of these layers of land lots, road networks, rivers etc. will give a map as displayed when previous Open Map function favored. This Open Layer function is actually

important and mostly used by in-house staff from within the Planning Department itself or from others departments within the MBI and used when the layer by layer information is required for specific task. This is also essential as Open Map function only displays few layers which is of the typical user's concern and where there are a numerous layers of data could be displayed through Open Layer function without which results in congested view of the map. This Open Layer function give the option to the user to select from numerous layers of information of only which layers of the map that he/she want to view.

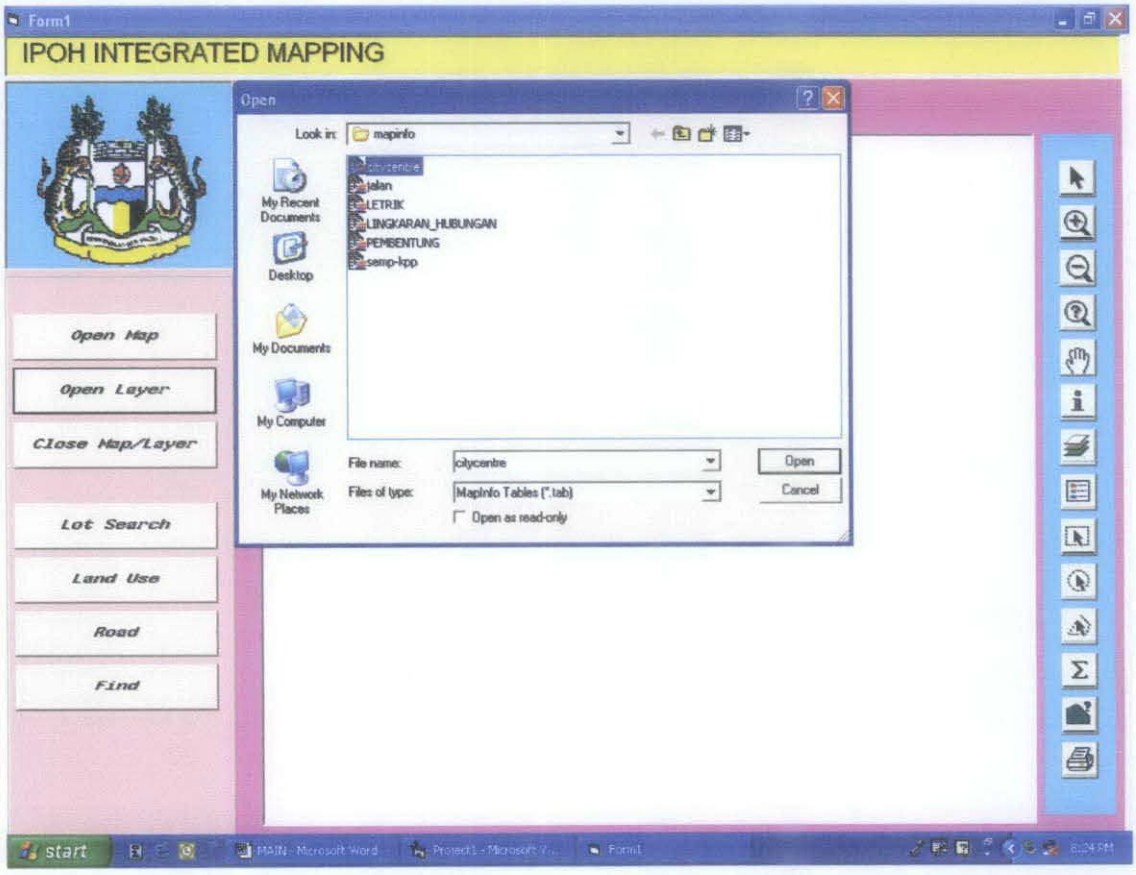

Fig. 4.3: A window prompts the user to make selection on which layer of the map to be displayed

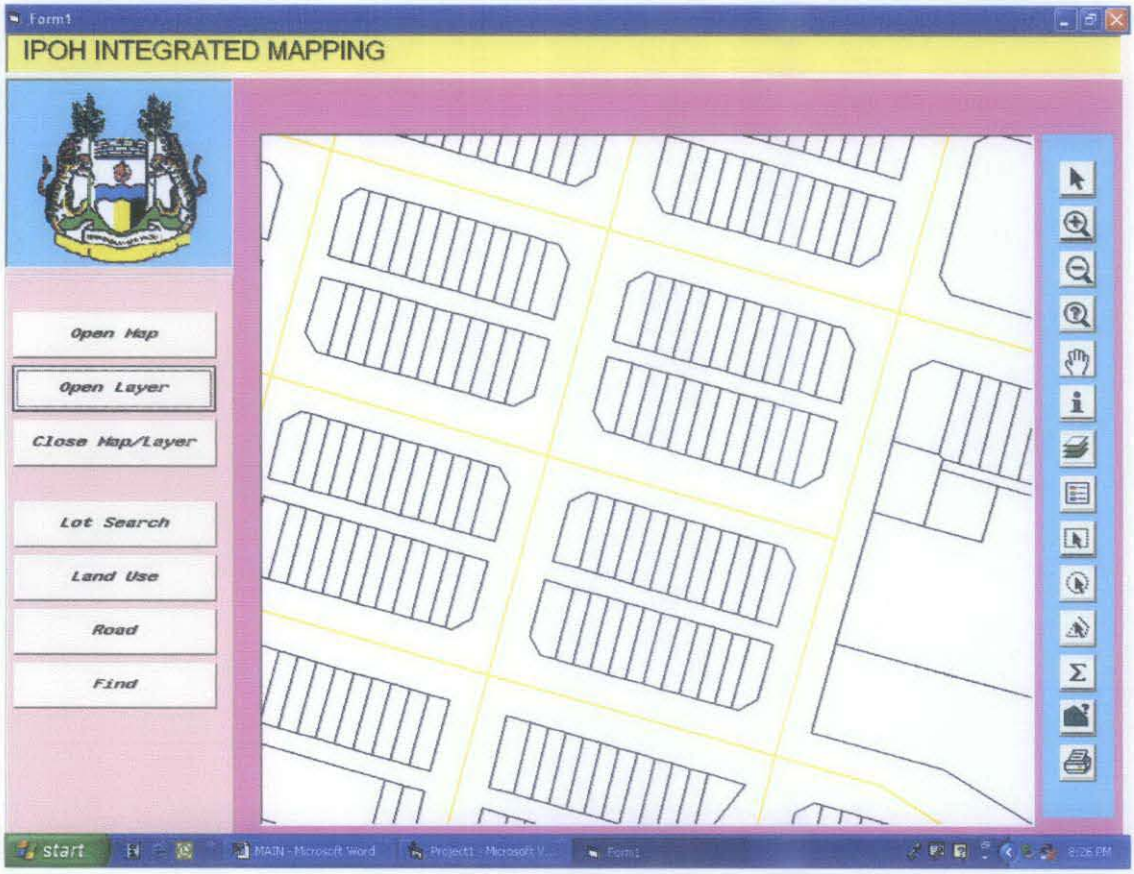

Fig. 4.4: Open Layer function allows user to open the map layer by layer for specific task. As shown are layer of land lots by polygon in black and layer of road networks by line in yellow

4.4 Close Map/Layer

As the name implies, this function closes the currently opened map and layers. For the latter, this function closes all layers that are currently opened simultaneously. To close layer by layer use Layer Control tool designated with  from the Toolbar. It is noted that the user must use this function if he/she would like to switch to Open Map from Open Layer and vice versa.

4.5 Query Functions

The following discussion will concentrates on the application's main purpose, query. Query functions consist of Lot Search, Land Use, Road and Find and they are not only used by the landowner who wants to know about their land and developments surrounding their land but also used by urban planners and engineers since it shows not only the spatial data of a particular land use or road for instance but also retrieve the files associated with that particular land or road for their planning and decision making activities.

4.5.1 Lot Search

This is one of many types of information on the urban characteristic that is mostly asked by the landowner who enter the Planning Department. The Lot Search function in this application allows user to search file of a particular lot within say, the city centre district of his/her concern and the user only needs to enter the corresponding lot number and the file referred to that particular lot will be displayed. The file referred here is not the whole comprehensive file attached to the lot but rather its brief information which is mostly used especially for planning application purposes.

4.5.2 Land Use

Land Use is the most important information on urban related matter since everything regarding urban infrastructure or economic development related with land use. Thus, it is the most important information that all users from landowner to engineers and urban planners will ask and needed for various purposes from apply to plan and develop land by the landowner to decide on the maintenance and upgrading works for a particular urban infrastructure system by engineers until to the urban planners to formulate a new pattern of land uses for a particular region so as to cater for the new demand in development of that region.

While Lot Search allows user to make file search based on lot number, Land Use function allows user to search for the same file based on the type of use of land of a particular land lot. Since this information is provided by the MBI where the medium of language used for all its operation and database system is in Malay Language, the user must enter the type of land use in Malay Language for instance *kediaman* for residential, *perdagangan* for business, *institusi* for institution, *kawasan lapang* for open space etc. It is noted that the result of this query is more than one (1) file while the previous Lot Search resulted in only one (1) file due to the nature of the user input on query itself.

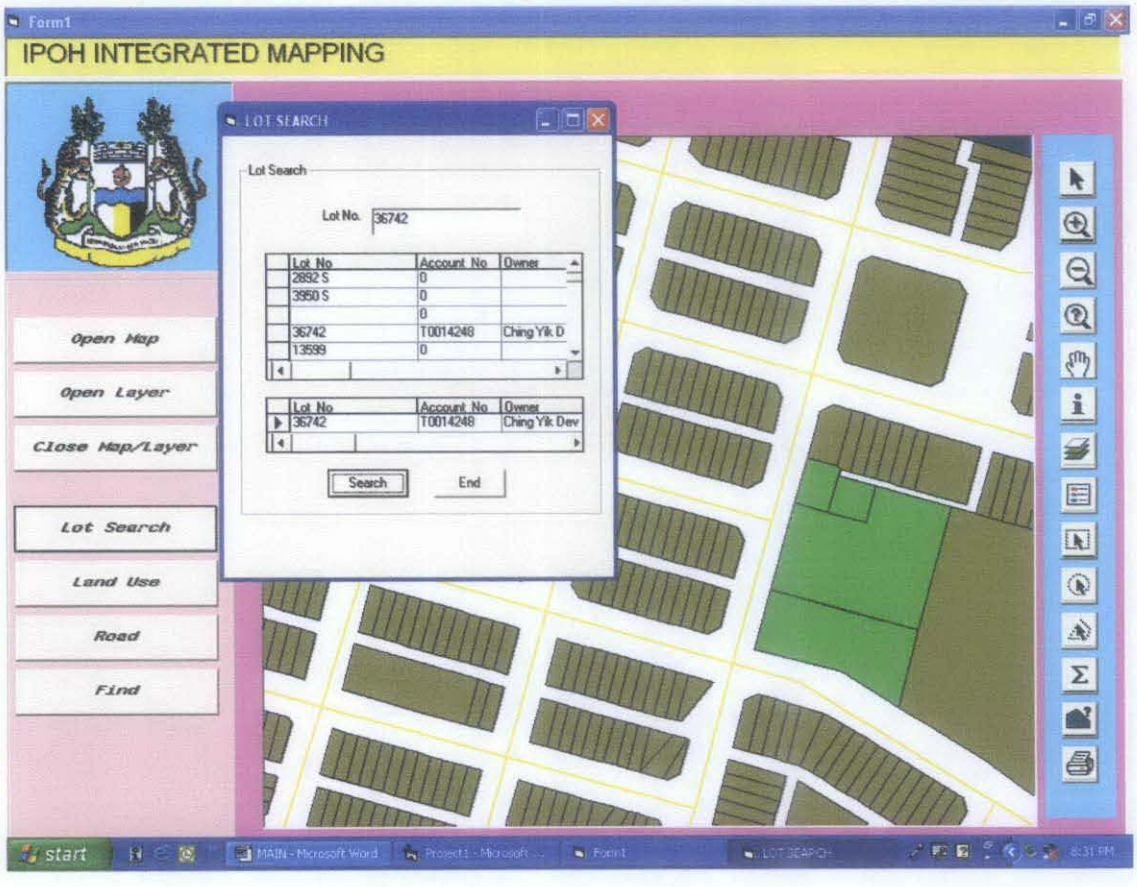

Fig. 4.5: Lot Search Window shows not only the searched file of a particular lot (bottom table of the window) but also allow the user to browse through the entire database of every recorded lot (top table of the window)

4.5.3 Road

This query function allows user to view associated information of a particular road within say, the city centre district by entering the corresponding road name. Information like road length, width, pedestrian road width etc. are examples of the information associated with the road. This function is mostly used by the staff from Engineering Department and Traffic Department for their operation as well as to support their decision making tasks (e.g. whether or not to designate a particular street as one-way street based on its traffic volume).

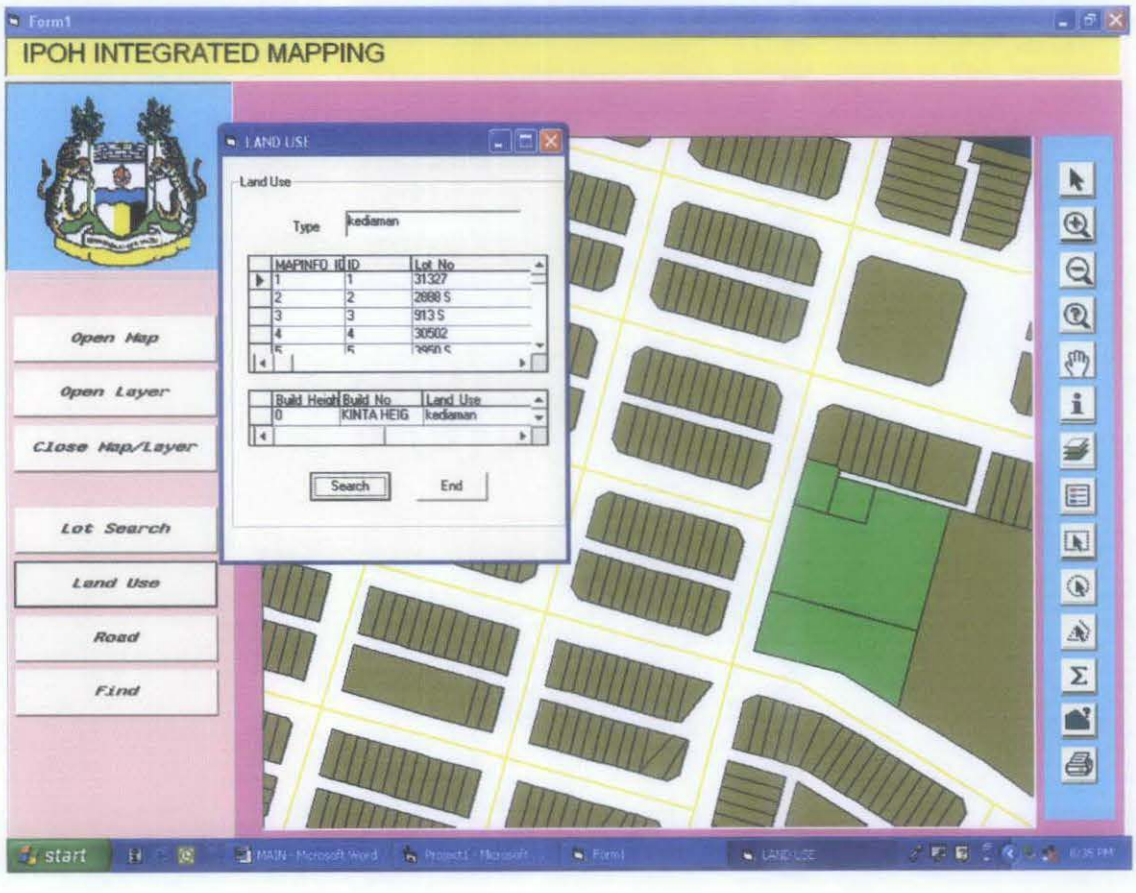

Fig. 4.6: The file corresponding to a particular land lot could also be searched based on its land use type

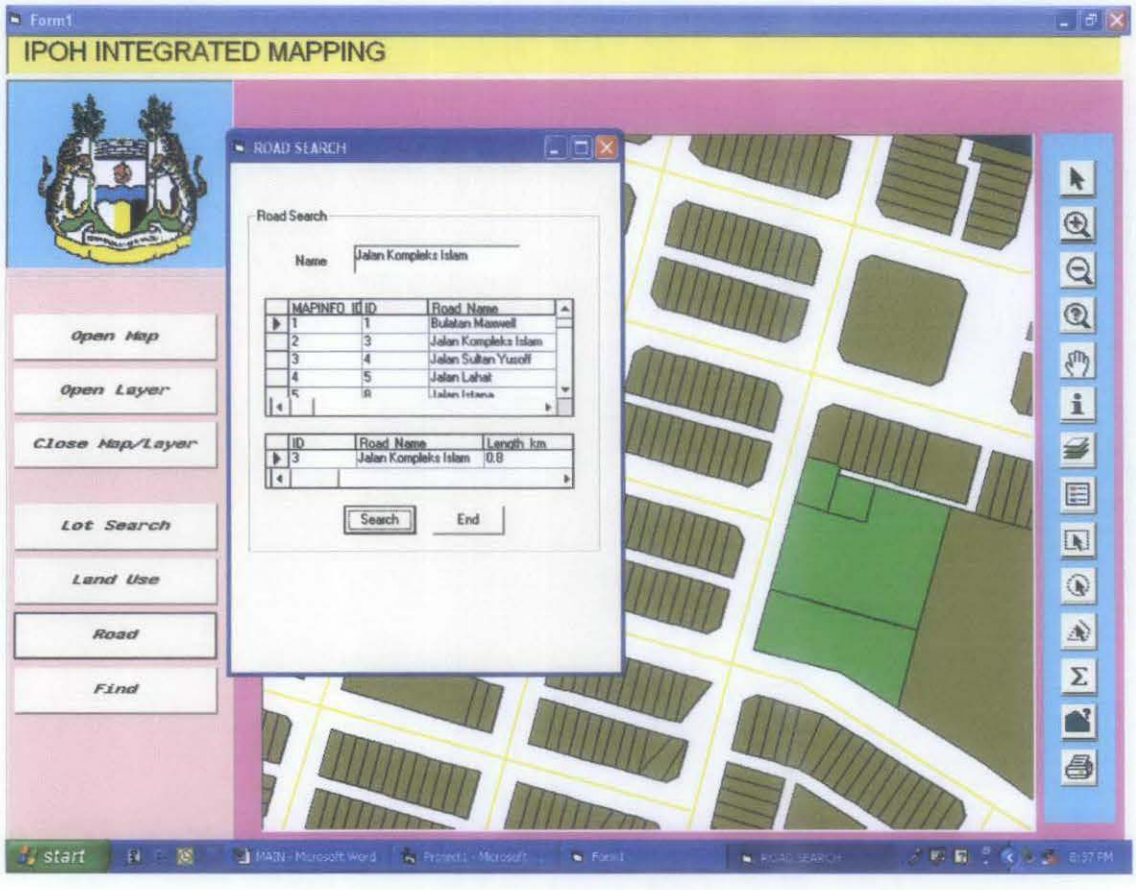

Fig. 4.7: Road function allows user to view corresponding file of a particular road

4.5.4 Find

This function allows the user to make search and show the result on the map rather than open its corresponding file and this function is more spatial based where the user say, can view the location of his/her lot on the map by the application highlights the location with symbol selected by the user in this function's mechanism. The spatial distribution of the particular land use for instance could also being produced via this function. While the input of previously discussed query functions; Lot Search, Land Use and Road, are based on lot number, land use type, and road name, respectively, this Find function allows user to make spatial search based on a wide number of input or

characteristics for instance lot identification number, owner or heights (esp. for building lot) for land lot related search. This function will be mostly used by the in-house staff either from within the Planning Department itself or others departments as well.

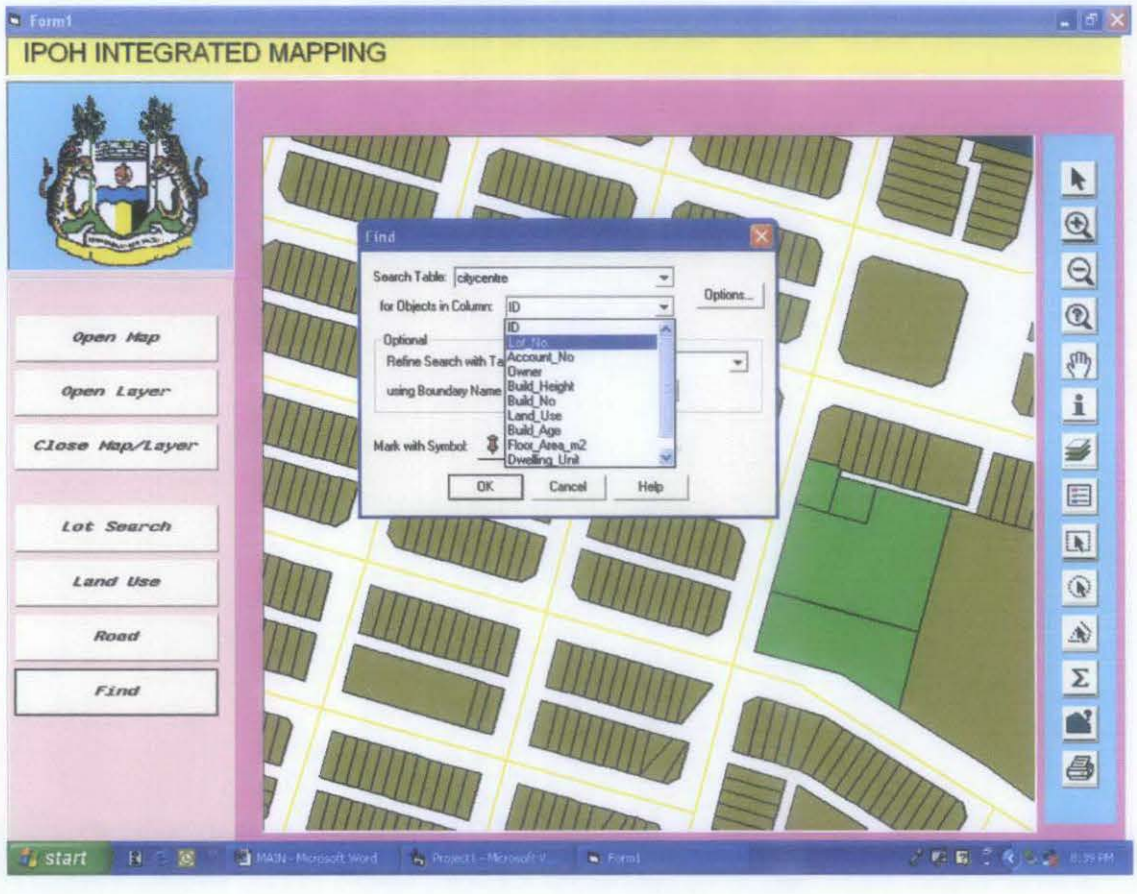

Fig. 4.8: Find function allows user to perform spatial search based on a wide array of search inputs as shown in the drop-down menu of the Find window

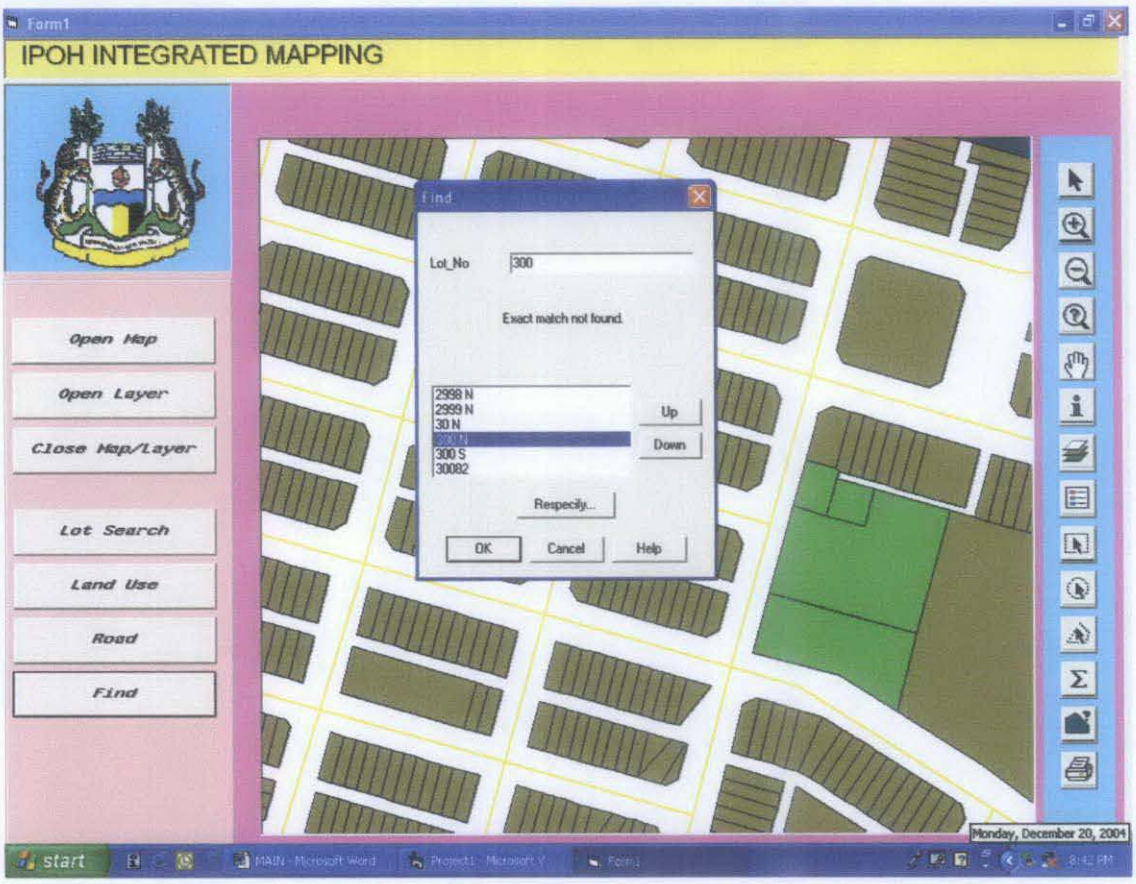

Fig. 4.9: The next event of Find mechanism after user has chosen the type of search input and highlight symbol

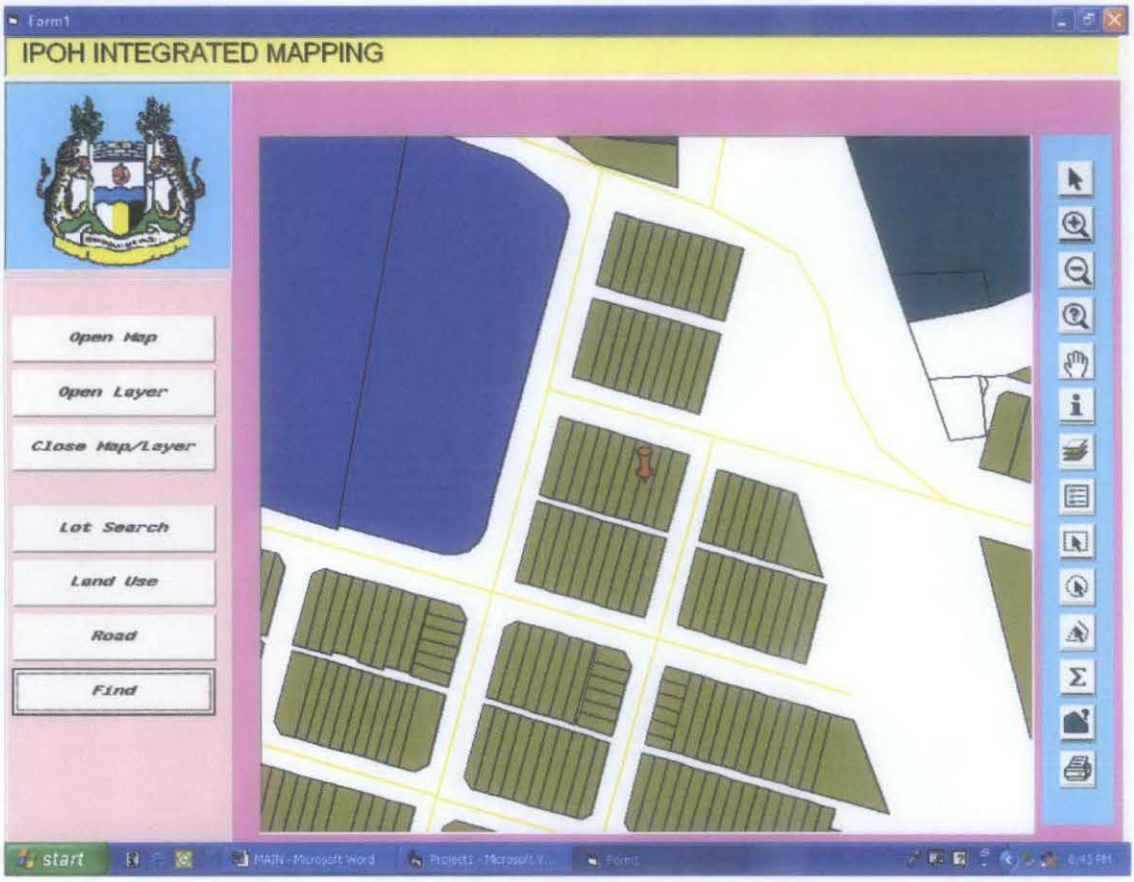

Fig. 4.10: The search result in Find will be displayed on map via use of symbol as shown

4.6 Tools for Map Working

This is referred to the tools provided at the rightmost part of the interface which consists of the necessary tools required to work with map, performing simple analysis as well as to print out map or results on queries. These are (from top to bottom) as follows;

i) Select
ii) Zoom In
iii) Zoom Out
iv) Change View
v) Pan
vi) Info Tool
vii) Layer Control
viii) Show/Hide Legend
ix) Marquee Select
x) Radius Select
xi) Polygon Select
xii) Show Statistics
xiii) Object Info
xiv) Print

4.6.1 Select

Select is the basic yet paramount tool to work with map. It is used to make a selection on the map object for example one may want to select a particular lot of land or road on the map for further task or analysis as simple as by asking the application to display its attributed information via Info Tool.

4.6.2 Zoom In and Zoom Out

Zoom In and Zoom Out function is also the very basic and yet the most important tools, more important than Select since these allow user to change the map view as to either refine the view towards detailed presentation or enlarge so as to view the location which is surrounding a particular site in a broader context and display.

4.6.3 Change View

Alternatively, the user may use this tool to change the view of the map in terms of zoom, map scale and choose preferred center of window (see Fig. 4.11)

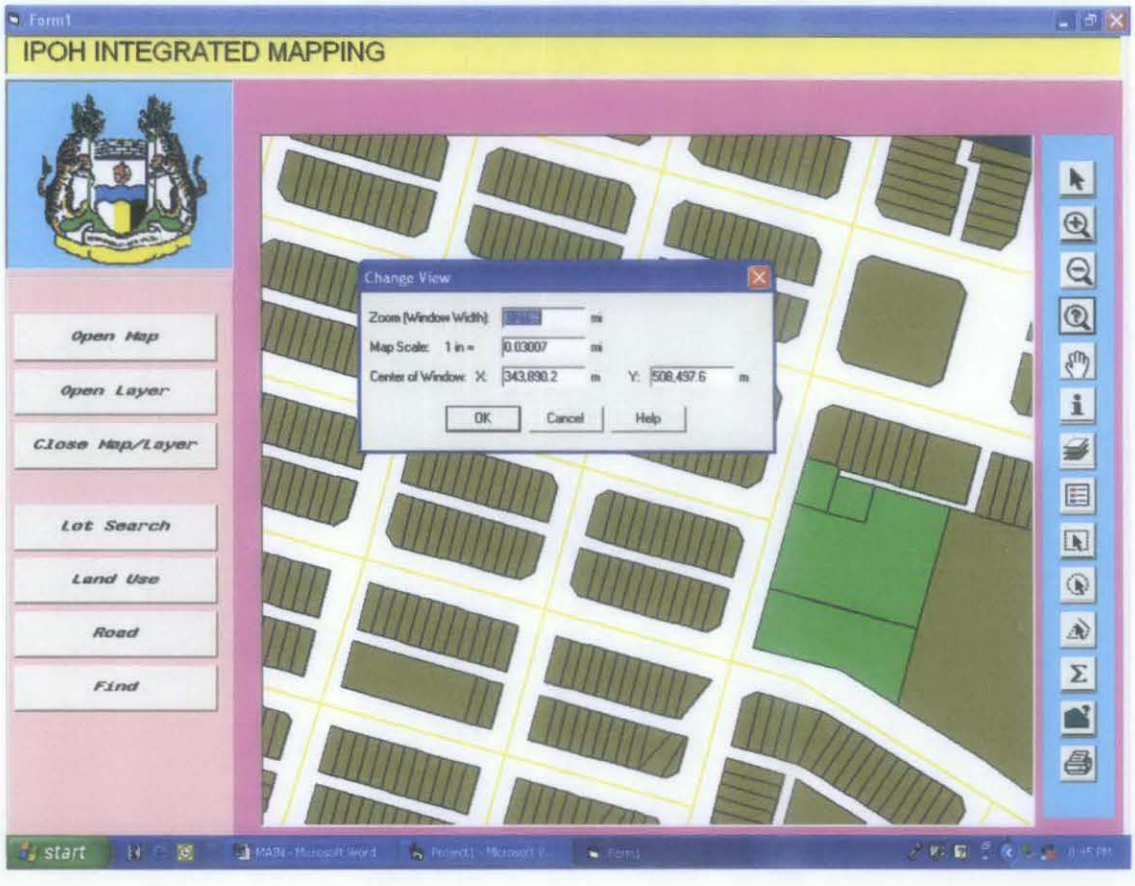

Fig. 4.11: Change View tool allows user to change the map window to preferred view

4.6.4 Pan

With a feature of hand, this common tool which can be seen in many other applications besides those related to map is to let the user to browse or move about the map so as the user may view other parts of the map which is hidden from immediate vision or confined window.

4.6.5 Info Tool

This is one of the unique features in mapping environment whereby data attributed to a particular map object (e.g. land lot or road) will be displayed in a simple window for a quick reference to the user (see Fig. 4.12). It is an alternative way for the user to search file for a particular lot or road as in the first three query functions; Lot Search, Land Use, and Road; since it displays the same set of data in a table form.

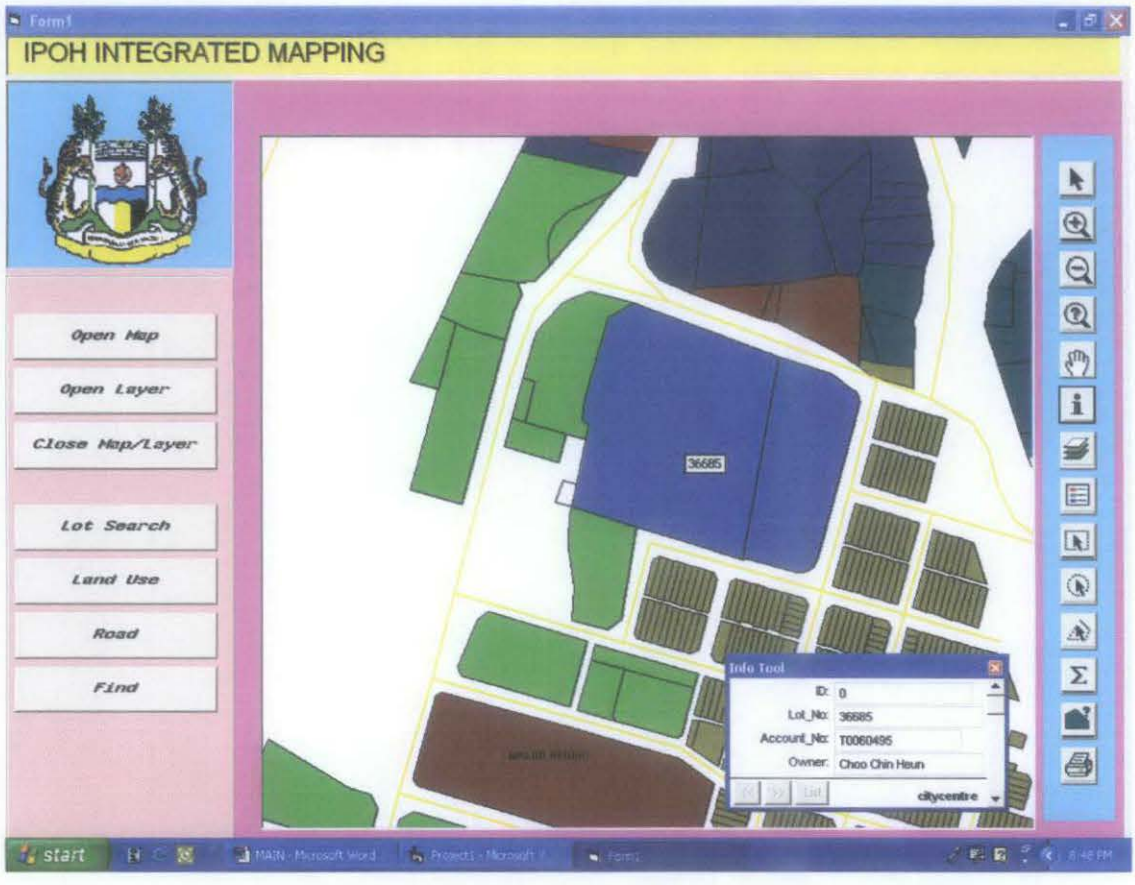

Fig. 4.12: Info Tool

4.6.6 Layer Control

Since the map is constructed in a number of layers or if the user uses the Open Layer function, the user might want to view only a certain layer of the map while hiding the others. Thus, he/she may click on the layer control command and de-activate layers of not of his/her interest through its resulted window (see Fig. 4.13). Fig. 4.14 shows an example whereby the road layer of the map was chosen to be hidden off from view by the user while retaining the others.

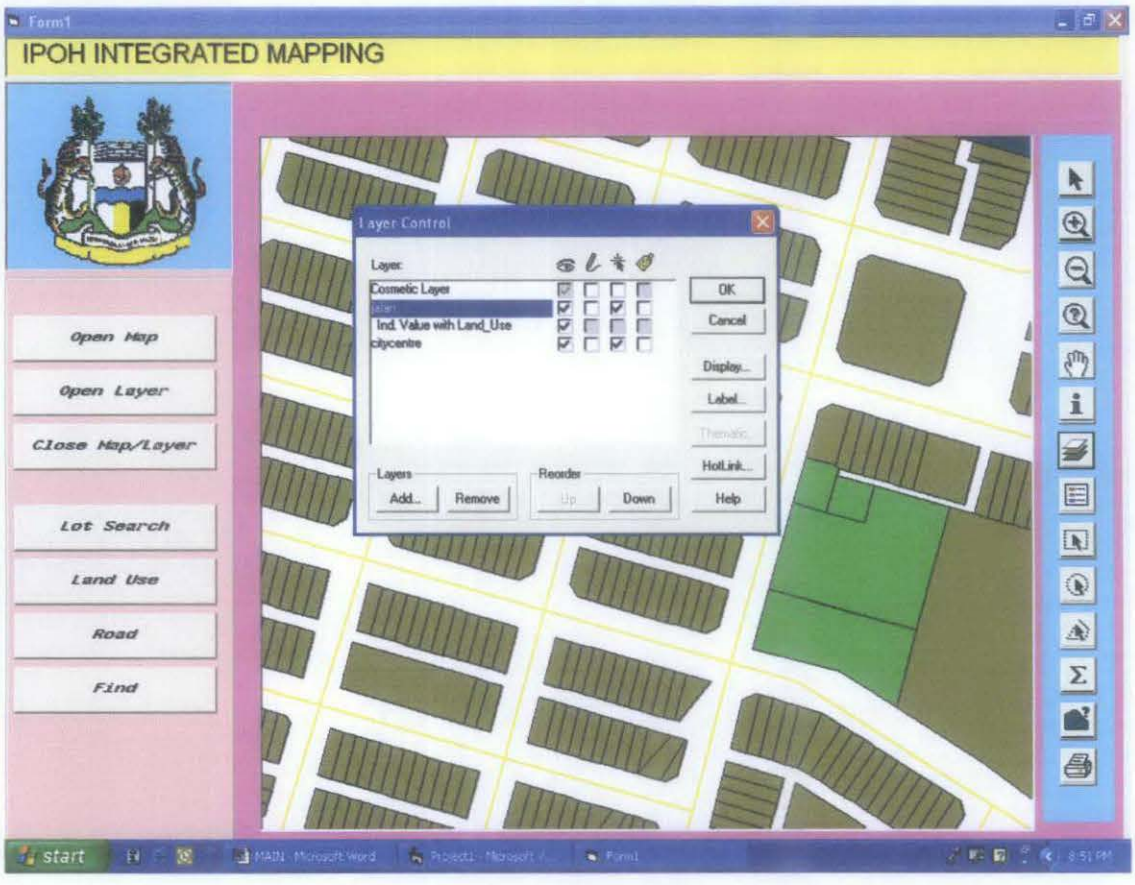

Fig. 4.13: Layer Control Tool

Layer Control tool, in fact, could do more than that. It is one of the tools which can be used by engineers to support their decision making on urban-related matters for instance to decide on the frequency of the road maintenance activity, to decide on whether or not to upgrade the current road networks to cater for surrounding development, to identify on the possible location for future road construction project based on the future pattern of land use, and even to estimate on the possible expenses needed for the road maintenance and upgrading works since all these decisions are related with the information on the dynamic pattern of land use of the city which is provided directly and in an effective way by the application. Not only benefit engineers but also to urban planners where information on the building heights, number of dwelling units in every lot, total built-up area, total area for open space etc. can be all labeled on the map to make

the user (engineers and urban planners) to view those data in a broader picture which incorporates many more factors and parameters for them to make informed and effective decision than the conventional method where all these information have to be sketched on the map which is tedious and time consuming. This application is much more effective when the area covered by the city or municipality is relatively huge and where the tasks of sketching and locating all information concerned on every single lot on the map by conventional means is totally arduous. Fig. 4.14 shows example where data on the street width of all roads throughout the city can be labeled via Layer Control tool. This can also be done easily with the Label button in the Layer Control window (see Fig. 4.13) to others types of data for instance building heights and ages, number of dwelling units on each lots, dimension of water supply pipes throughout the city and thus their corresponding flow and pressure characteristics, size and capacity of sewer line and drains etc. where the first two (2) are important for urban planners to support and formulate decision on whether or not to revise their zoning plan while the rest critical for engineers to identify location where upgrading works of the current systems are needed.

4.6.7 Show/Hide Legend

As the name implies, the purpose of this tool is to display the legend for the map for ease of references (refer back Fig. 4.2)

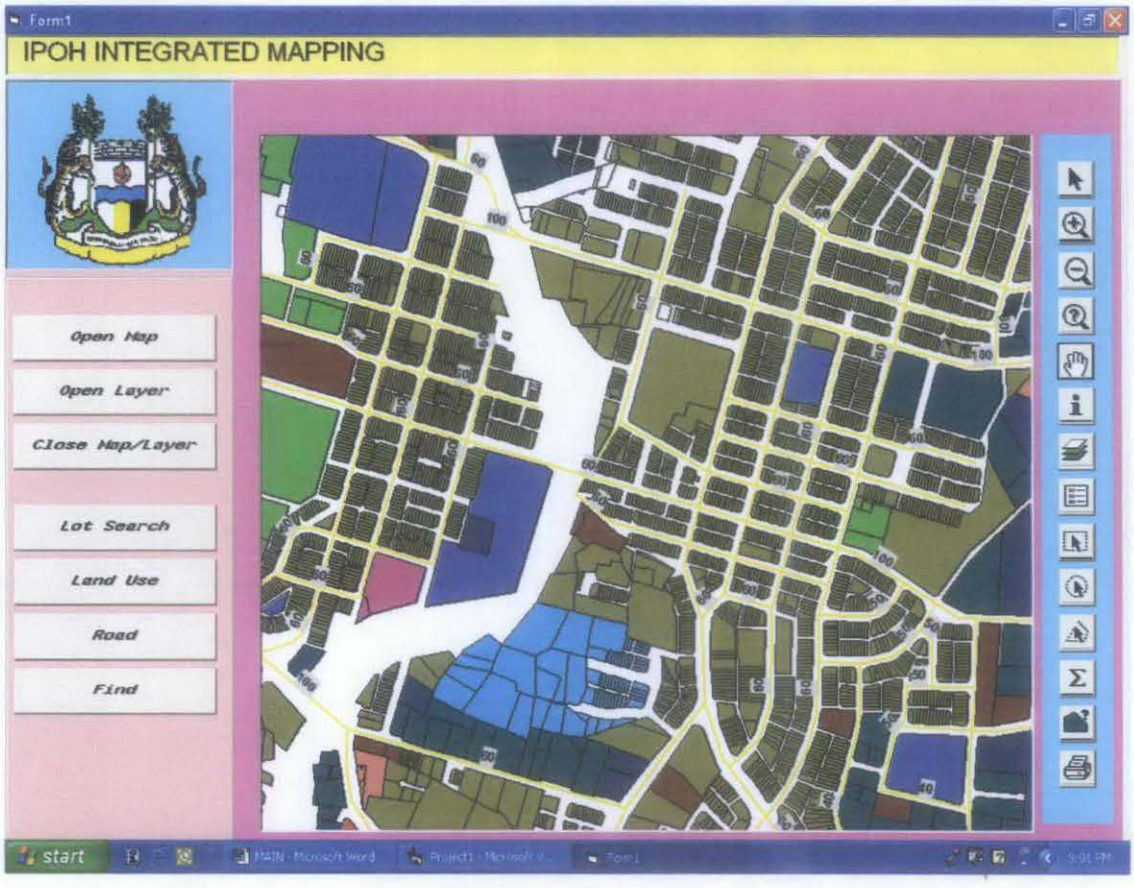

Fig. 4.14: Info Label on the street width of all road networks throughout the city via Layer Control makes engineering decision more effective like on whether the current road conditions are synchronized with the surrounding development

4.6.8 Marquee Select, Radius Select, Polygon Select

Similar like Select tool, Marquee Select, Radius Select and Polygon Select allows user to select more than one (1) object on the map for further analysis via square/rectangular or marquee shape, radius shape, and polygon shape, respectively. This set of tools is typically used in conjunction with Show Statistics tool.

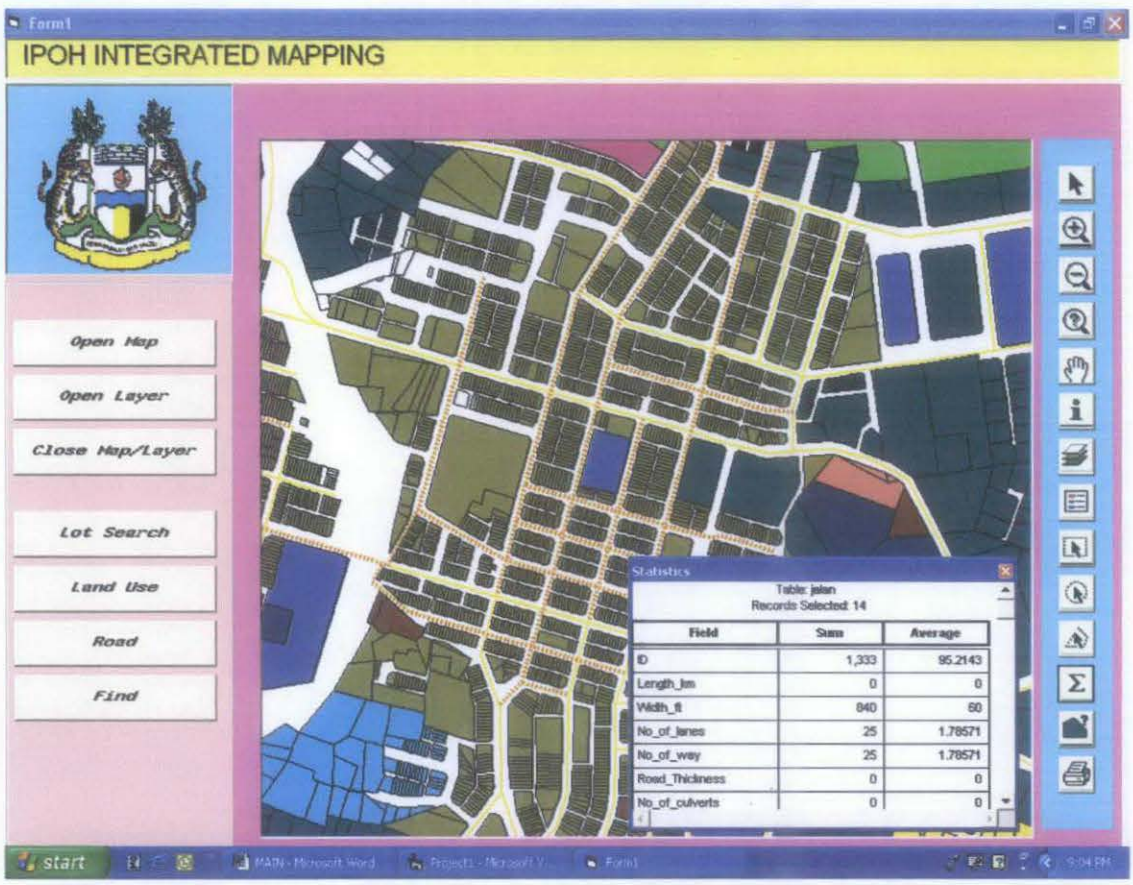

Fig. 4.15: Show Statistics Tool

4.6.9 Show Statistics

This is another tool in the application which supports engineers and urban planners in their decision making activities. This tool is associated with a kind of simple analysis performed by the application and it is used in conjunction with Marquee, Radius or Polygon Select tools. The window corresponds to this tool shows the user on the sum and average of each object's properties (e.g. sum of building heights of 100 lots and its average). Fig. 4.14 shows sums and averages of several characteristics for 15 roads selected via Marquee Select. For instance, urban planners can easily identify the average of the building heights or the total number of dwelling units of a particular area or radius for them to limit the heights of building or the total floor space ratio for the next development on that area inside their new zoning plan.

4.6.10 Object Info

This tool presents to the user information on the total area, total perimeter length, and its corresponding position related information on X-Y coordinate system of a particular map object (land lot or road). This tool will only be activated after user has selected a particular object of concern via Select tool (see Fig. 4.15)

4.6.11 Print

As the name implies, this tool allows the user to print out the map or results on query or analysis done by the application for their record and various uses. One example of the use of spatial data on the lot location and its surrounding land uses is in planning application which is required by the landowner or developer who want to develop or redevelop his/her land.

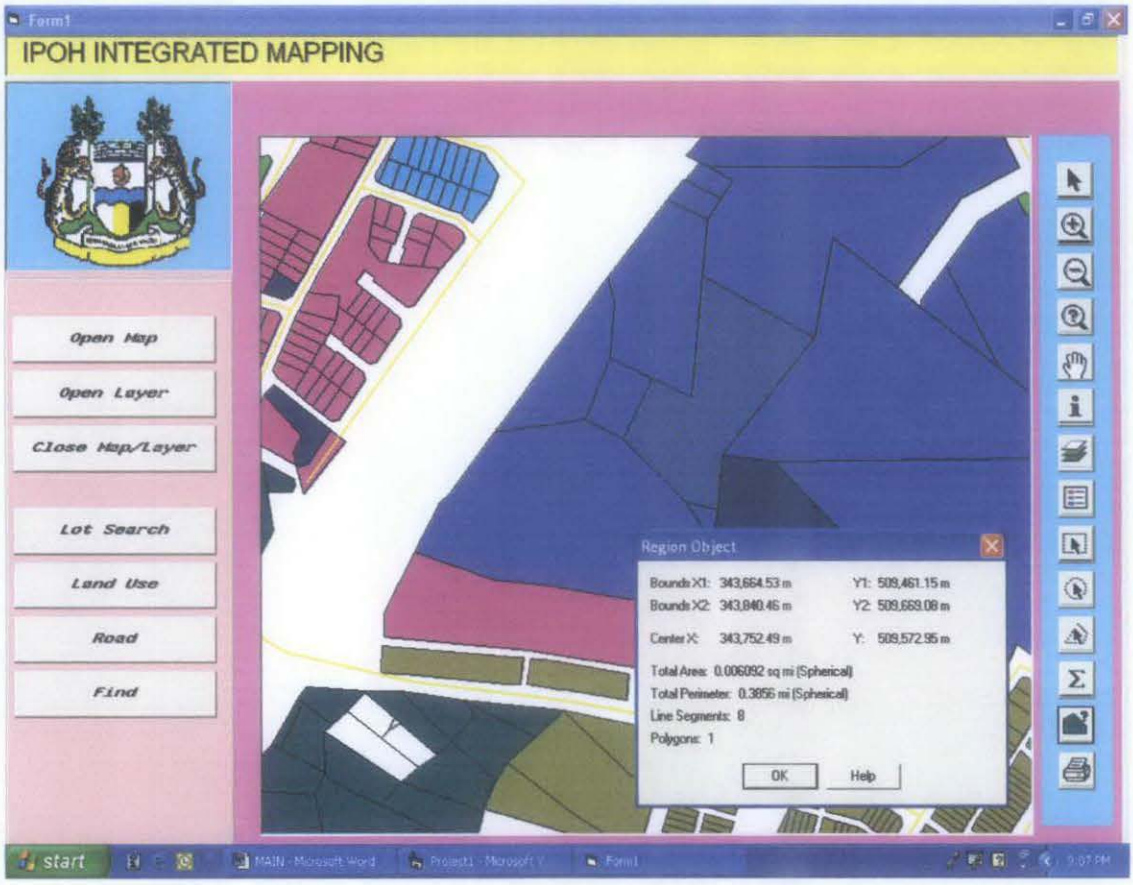

Fig. 4.16: Object Info Tool showing information on total area, total perimeter as well as position-related information of the map object

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

While this product has met its objectives on improving the method of delivery of urban related information to various users and as one of the planning and decision-making support system to urban planners and engineers on urban related matter, the objective of whether or not the application can reduce the number of front-desk staff and time needed for a person to attain required information on the urban characteristics of which the application has supported has to be experimented by putting this application at the front-desk of the planning department for it to be accessed by public and gain possible feedback from the department's survey on the public response. To test on whether or not this application will benefit urban planner or engineer of the MBI itself is by simply asking them to try out and make this application as part of their planning and decision support system and surely one will found out much more positive response. Just try it once and one will found out it is so effective as compared with the conventional method. In whatever speculation whatsoever on whether the application will meet its very main objectives, it has been certain that this product will be employed by the MBI Planning Department as the main component of their routine data sharing and delivery system as well as a planning and decision-making support tools for urban planners and engineers from MBI and others government's agencies and individuals.

5.2 Recommendation

To enhance the product's effectiveness in future which is out of the scope of this project, it is recommended that the application is made accessible on every MBI staff personal computer of all related departments via local area network as well accessible to others local authorities and government's agencies via appropriate means without them need to come to the Planning Department to attain those urban related information for their uses.

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APPENDICES

1. Application's Visual Basic Coding Environment for Form 1 (Main Interface & Map Working Tools)

```
Option Explicit

Private Sub Command1_Click()
Form3.Show
End Sub

Private Sub Command10_Click()
mi.RunMenuCommand 1702
End Sub

Private Sub Command11_Click()
mi.RunMenuCommand 1707
mi.Do "set window info parent " & Form1.Picture2.hWnd
End Sub

Private Sub Command12_Click()
mi.RunMenuCommand 801
End Sub

Private Sub Command13_Click()
'mi.RunMenuCommand 207
'mi.Do "Set Next Document Parent " & Form1.Picture2.hWnd & "Style 1"
End Sub

Private Sub Command14_Click()
mi.RunMenuCommand 300
End Sub

Private Sub Command15_Click()
mi.RunMenuCommand 112
End Sub
```

```
Private Sub Command16_Click()
mi.RunMenuCommand 805
End Sub

Private Sub Command17_Click()
mi.RunMenuCommand 305
End Sub

Private Sub Command18_Click()
mi.RunMenuCommand 104
End Sub

Private Sub Command19_Click()
mi.RunMenuCommand 1722
End Sub

Private Sub Command2_Click()
Form4.Show
End Sub

Private Sub Command20_Click()
mi.RunMenuCommand 1703
End Sub

Private Sub Command21_Click()
mi.RunMenuCommand 1700
End Sub

Private Sub Command22_Click()
mi.RunMenuCommand 207
End Sub

Private Sub Command3_Click()
Form2.Show
End Sub

Private Sub Command4_Click()
mi.Do "Run Application ""C:\Map.WOR"""
mi.Do "Set Next Document Parent " & Form1.Picture2.hWnd & "Style 1"
```

```
Private Sub Command6_Click()
Call OpenATable

End Sub

Private Sub Command7_Click()
mi.RunMenuCommand 1701
End Sub

Private Sub Command8_Click()
mi.RunMenuCommand 1705
End Sub

Private Sub Command9_Click()
mi.RunMenuCommand 1706
End Sub

Private Sub Form_Load()

Set mi = CreateObject("MapInfo.Application")
mi.Do "Set Application Window " & Form1.hWnd
End Sub

Private Sub Form_QueryUnload(Cancel As Integer, UnloadMode As Integer)
Set mi = Nothing
End Sub
```

2. Application's Visual Basic Coding Environment for Form 2 (Road)

```
Private Sub Command1_Click()
Adodc1.RecordSource = "SELECT * FROM jalan1 WHERE Nama_jalan ='" & txtKeyword.Text & "'"
Adodc1.Refresh
Set DataGrid2.DataSource = Adodc1
End Sub

Private Sub Command2_Click()
Unload Me
End Sub
```

```
Private Sub DataGrid1_Click()
DataGrid1.DataChanged = False
End Sub

Private Sub Form_Load()
Adodc2.RecordSource = "Select * from Jalan1"
Adodc2.Refresh
Set DataGrid1.DataSource = Adodc2
End Sub
```

3. Application's Visual Basic Coding Environment for Form 3 (Lot Search)

```
Private Sub Command1_Click()
Adodc1.RecordSource = "SELECT * FROM citycentre1 WHERE No_lot ='" & txtKeyword.Text & "'"
Adodc1.Refresh
Set DataGrid2.DataSource = Adodc1
End Sub

Private Sub Command2_Click()
Unload Me
End Sub

Private Sub DataGrid1_Click()
DataGrid1.DataChanged = False
End Sub

Private Sub Form_Load()
Adodc2.RecordSource = "Select * from citycentre1"
Adodc2.Refresh
Set DataGrid1.DataSource = Adodc2
End Sub
```

4. Application's Visual Basic Coding Environment for Form 4 (Land Use)

```
Private Sub Command1_Click()
Adodc1.RecordSource = "SELECT * FROM citycentre1 WHERE Gunatanah_lulus ='" & txtKeyword.Text & "'"
Adodc1.Refresh
Set DataGrid2.DataSource = Adodc1
End Sub
```

```
Private Sub Command2_Click()
Unload Me
Form1.Show
End Sub

Private Sub DataGrid1_Click()
DataGrid1.DataChanged = False
End Sub

Private Sub Form_Load()
Adodc2.RecordSource = "Select * from citycentre1"
Adodc2.Refresh
Set DataGrid1.DataSource = Adodc2
End Sub
```

5. Application's Visual Basic Coding Environment for Module 1 (Open Layer)

```
Option Explicit
Public itsamap As Boolean
Public mapWinID As Long
Public mi As Object
Public Sub OpenATable()
  Dim file_name As String
   Dim tabName As String
   On Error GoTo userCancelled
  Form1.CommonDialog1.Filter = "MapInfo Tables (*.tab)|*.tab"
  'Form1.CommonDialog1.Filter = "mapinfo workspace(.*wor) | *.tab"
   Form1.CommonDialog1.FilterIndex = 1
  Form1.CommonDialog1.ShowOpen
   file_name = Form1.CommonDialog1.FileName
   tabName = mi.Eval("PathToTableName$( """ & file_name & """ )")
   mi.Do "Open Table """ & file_name & """ as " & tabName
mi.Do "Set Table " & tabName & " ReadOnly"
   If mi.Eval("TableInfo(" & tabName & "," & 5 & ")") = "F" Then
      MsgBox "This table is not mappable. I couldn't open that!"
     mi.Do "Close Table " & tabName
      Exit Sub
 End If
   If itsamap Then
     mi.Do "Add Map Layer " & tabName
```

```
    Else
        mi.Do "Set Next Document Parent " & Form1.Picture2.hWnd & " Style 1"
       mi.Do "Map From " & tabName
        mapWinID = CLng(mi.Eval("FrontWindow()"))
        itsamap = True
    End If
    Exit Sub
userCancelled:
    Exit Sub
End Sub
```